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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/558,917	08/29/2006	Michael S. Wong	1789-12702	8501

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EXAMINER	
JOHNSON, KEVIN M	

ART UNIT	PAPER NUMBER
1793	

NOTIFICATION DATE	DELIVERY MODE
03/19/2010	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/558,917	WONG ET AL.	
	Examiner	Art Unit	
	KEVIN M. JOHNSON	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 October 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-5,9-12,19 and 21-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-5,9-12,19,21-28,30,31 and 33-38* is/are rejected.

7)☒ Claim(s) *29 and 32* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12/9/2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 12/9/2009 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 36-38 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 36 recites the limitation ""the first catalyst" in line 2. There is insufficient antecedent basis for this limitation in the claim. For the purposes of examination the claim has been interpreted as requiring a first catalyst in the form of a nanoparticle. Claims 37 and 38 are dependant on claim 36 and fail to remedy the deficiency.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-5, 7-12, 19-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al. (Nano Letters, 2001, Vol.1, No. 11, p 637-642).

In regard to claim 1, Wong teaches a method of producing mesoporous metal oxides using nanoparticle precursors. The method comprises preparing a colloidal nanoparticle sol and a solution of a surfactant and an ammonium metatungstate salt, mixing the solutions to form a precipitate with an organic-inorganic structure, drying the material in air and then the removal of the pore-forming agent from the dried material (column 1, p 638). The temperature of the air drying step is not taught.

It would have been obvious to one of ordinary skill in the art at the time of the invention that the drying took place at room temperature because Wong fails to disclose that it takes place at a different temperature, and the statement "left to dry in air overnight" implies no heating or cooling of the material.

In regard to claim 4, Wong teaches a method of producing a mesoporous metal oxide catalyst where instead of using pre-formed nanoparticles, a nanoparticle precursor salt was added to the surfactant solution (Column 1, p 641).

In regard to claim 5, Wong teaches the use of zirconium oxide (column 1, p 638), titania (column 2, p 640) and alumina nanoparticles (column 1, p 641).

In regard to claims 9 and 11, Wong teaches that the material is completely amorphous (column 2, p 638).

In regard to claim 10, it would have been obvious to one skilled in the art at the time of the invention that due to the surface area of 130 m^2/g and WO_3 loading of 30.5 wt-% taught by Wong, the surface density of the tungsten oxide on the zirconia would be approximately 6.0 molecules/nm^2. It is known in the art that the monolayer surface density of tungsten on a zirconia support is 4 molecules/nm^2, and therefore the surface density of the material produced by Wong exceeds the monolayer surface density of the catalytic component.

In regard to claims 19, 21-23 and 25-26, the surfactant used by Wong is a nonionic poly(ethylene oxide)-poly(polypropylene oxide)-poly(ethylene oxide) triblock copolymer of the form $EO_{20}PO_{70}EO_{20}$ in conjunction with zirconium oxide nanoparticles and a catalytic component comprising tungsten (column 1, p 638).

In regard to claim 27, Wong teaches that the material is calcined to remove the pore-forming agent (column 1, p 638).

In regard to claims 36 and 38, Wong teaches a method of producing mesoporous metal oxides using nanoparticle precursors. The method comprises preparing a colloidal nanoparticle sol and a solution of a surfactant and an ammonium metatungstate salt, mixing the solutions to form a precipitate with an organic-inorganic structure, drying the material and then the removal of the pore-forming agent from the dried material (column 1, p 638). The nanoparticles are either zirconia or titania (pp. 638 and 640). It is well known in the art that titania and zirconia are catalyst

5. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wong as applied to claim 1 above, and further in view of Winter (US 3907921).

In regard to claim 28, Wong fails to teach that the porous catalyst is impregnated with an additional catalyst precursor or non-surfactant polymer.

Winter teaches that it is well known in the art to impregnate porous materials with catalyst precursors to improve the catalytic function of the porous material (column 3, lines 46-58).

It would have been obvious to one skilled in the art at the time of the invention to impregnate the porous material disclosed by Wong with a catalyst precursor. This modification would have been motivated by the teaching in Winter that it is well known in the art that impregnating catalyst precursors in to porous materials improves the catalytic performance of the material (column 3, lines 46-58).

6. Claims 3, 33 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong as applied to claim 1 above, and further in view of Ying et al. (US 5958367).

In regard to claim 3, Wong discloses that that the method may be employed with titania nanoparticles and that the nanoparticle/surfactant templating methodology is general and may be applied to other types of surfactants (p. 640-641). Wong fails to teach the use of an anionic or zwitterionic surfactant as the pore-forming agent.

Ying discloses that anionic surfactants may be utilized as pore-forming agents in the production of porous oxide materials (column 23, line 44 – column 24, line 2).

It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize an anionic surfactant in the process disclosed by Wong. Such a modification would have been motivated by the teaching in Ying that anionic surfactants are especially useful for the production of porous oxide materials and the teaching in Wong that the methodology of the process is expected to apply to a wide variety of surfactants.

In regard to claims 33 and 35, it is well established that any order of performing process steps is *prima facie* obvious in the absence of new or unexpected results (MPEP 2144.04 IV C). It would have been obvious to one of ordinary skill in the art that in the process disclosed by Wong the organic-inorganic gel structure is formed by the hydrolysis and condensation of the ammonium metatungstate salt based on the WO_3 contained in the final product. All other limitations have been addressed in the above rejection of claims 1 and 3.

7. Claim 30 rejected under 35 U.S.C. 103(a) as being unpatentable over Wong in view of Hwang et al. (Chem. Commun., 2001, pp. 1738-1739).

In regard to claim 30, Wong discloses the use of nanoparticles with diameters as low as 3 nm (p.638), but fails to teach the use of nanoparticles with a diameter of 2 nm.

Hwang discloses a process for the production of porous catalysts incorporating titania nanoparticles as building blocks (p. 1789). The nanoparticles beneficially exhibit a diameter of 1.6-2 nm (p. 1739).

It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize nanoparticles with a diameter of 2 nm in the process disclosed by Wong. Such a modification would have been motivated by the teaching in Wong that titania nanoparticles may be used in the process and that nanoparticles with a diameter of 3 nm were successfully employed in addition to the teaching in Hwang that titania nanoparticles with a diameter of 1.6-2 nm are especially useful as building blocks when forming a porous oxide catalyst. It is well established that any order of performing process steps is *prima facie* obvious in the absence of new or unexpected results (MPEP 2144.04 IV C).

8. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wong and Hwang as applied to claim 30 above, and further in view of Ying et al. (US 5958367).

In regard to claim 31, Wong discloses that that the method may be employed with titania nanoparticles and that the nanoparticle/surfactant templating methodology is

general and may be applied to other types of surfactants (p. 640-641). Wong fails to teach the use of an anionic or zwitterionic surfactant as the pore-forming agent.

Ying discloses that anionic surfactants may be utilized as pore-forming agents in the production of porous oxide materials (column 23, line 44 – column 24, line 2).

It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize an anionic surfactant in the process disclosed by Wong. Such a modification would have been motivated by the teaching in Ying that anionic surfactants are especially useful for the production of porous oxide materials and the teaching in Wong that the methodology of the process is expected to apply to a wide variety of surfactants.

9. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wong and Ying as applied to claim 33 above, and further in view of Hwang.

In regard to claim 34, Wong discloses the use of nanoparticles with diameters as low as 3 nm (p.638), but fails to teach the use of nanoparticles with a diameter of 2 nm.

Hwang discloses a process for the production of porous catalysts incorporating titania nanoparticles as building blocks (p. 1789). The nanoparticles beneficially exhibit a diameter of 1.6-2 nm (p. 1739).

It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize nanoparticles with a diameter of 2 nm in the process disclosed by Wong. Such a modification would have been motivated by the teaching in Wong that titania nanoparticles may be used in the process and that nanoparticles with a diameter of 3 nm were successfully employed in addition to the teaching in Hwang that titania

nanoparticles with a diameter of 1.6-2 nm are especially useful as building blocks when forming a porous oxide catalyst.

10. Claims 12 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong and Ying as applied to claim 1 above, and further in view of Brinker et al. (Adv. Mater., 1999, 11, No. 7, pp. 579-585).

In regard to claim 12, Wong fails to disclose that catalytic precursor is partially polymerized during the formation of the organic-inorganic structure.

Brinker discloses that in processes for the self-assembly of organic-inorganic structures both organic and inorganic polymerization is required to complete the formation of the ordered structure.

It would have been obvious to one of ordinary skill in the art at the time of the invention that the inorganic polymerization taught by Brinker would affect the inorganic catalyst precursor taught by Wong due to the similar nature of the ordered structure produced in the process taught by Wong.

In regard to claim 24, Wong fails to teach the use of a cationic, anionic or zwitterionic surfactant. However, Wong does teach that the nonionic surfactants employed in the process associate with an H+ ion, and act in a manner similar to a cationic surfactant (column 2, p 640).

Brinker teaches the use of the cationic surfactant cetyltrimethylammonium bromide (CTAB) as a pore-forming and structure directing agent (column 2, p 580) when forming porous oxide materials.

It would have been obvious to one skilled in the art at the time of the invention to substitute CTAB for the pluronic P123 surfactant used by Wong in the synthesis of the mesoporous metal oxide. This would have been motivated by the teaching in Wong that the nonionic surfactant bonds with a hydrogen ion to achieve a positive charge (column 2, p 640) so that it acts in a similar manner to cationic surfactants, the suggestion in Wong that other types of surfactants could be used (column 2, p 641) and the disclosure in Brinker that CTAB is useful as a cationic pore-forming agent in the production of porous oxide materials.

11. Claims 34-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong in view of Tai et al. (US 6569358).

In regard to claim 36, Wong discloses that the nanoparticle/surfactant templating route can accommodate particles with different compositions (p. 641), but fails to expressly disclose that the nanoparticles may be metallic.

Tai discloses that it is beneficial to incorporate metallic nanoparticles in to porous catalysts to increase the catalytic abilities of the catalyst material.

It would have been obvious to one of ordinary skill in the art at the time of the invention to substitute metallic nanoparticles for the oxide nanoparticles disclosed in the process taught by Wong. Such a modification would have been motivated by the teaching in Wong that the nanoparticles may have a different composition and the disclosure in Tai that metallic nanoparticles are beneficially included in porous catalysts.

In regard to claim 37, Wong fails to disclose the use of supercritical drying of the organic-inorganic gel structure to form an aerogel.

Tai discloses that supercritical drying may be utilized to form an aerogel. A benefit of producing an aerogel is the ability to produce porous catalysts with varying densities (column 4, lines 41-43).

It would have been obvious to one of ordinary skill in the art at the time of the invention to utilize supercritical drying to produce an aerogel containing metallic nanoparticles. Such a modification would have been motivated by the teaching in Tai that the use of supercritical drying to produce aerogel catalysts that incorporate nanoparticles allows porous catalysts that have varied densities, allowing the catalyst properties to be tailored for different applications.

In regard to claim 38, both Wong and Tai disclose that the nanoparticle and the secondary metal salt do not comprise the same metal. Wong prefers a Zr or Ti based nanoparticle with a W salt and the preferred embodiment in Tai is Au nanoparticles with Si salts.

Allowable Subject Matter

1. Claims 29 and 32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The instant claims are differentiated from the closest prior art, Wong, by the requirement that the composition is formed without precipitation. The process disclosed by Wong requires precipitation.

Response to Arguments

1. Applicant's arguments with respect to the pending claims have been considered but are moot in view of the new ground(s) of rejection. The amendment to the claims removing the requirement that the solution be clear, broadening the scope of the instant claims, necessitated the new grounds of rejection applied to claims 1, 3-5, 9-12, 19 and 21-28. The amendment to claims 30 and 33 requiring specific catalyst precursors that had not been previously present in the claims necessitated the new grounds of rejection applied to claims 30, 31 and 33-35.

Conclusion

1. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEVIN M. JOHNSON whose telephone number is (571)270-3584. The examiner can normally be reached on Monday-Friday 9:00 AM to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Curtis Mayes can be reached on 571-272-1234. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Kevin M Johnson/
Examiner, Art Unit 1793

/David M Brunsman/
Primary Examiner, Art Unit 1793